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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/397,952	09/17/1999	AFTAB AHMAD	MICRON.061DV	9448

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EXAMINER

RAO, SHRINIVAS H

ART UNIT PAPER NUMBER

2814

DATE MAILED: 06/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Applicati n No.

09/397,952

Applicant(s)

AHMAD, AFTAB

Examin r

Steven H. Rao

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 09 April 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☐ Claim(s) 1,3-15 and 23-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1,3-15, 23-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Pri rity under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

***Response to Amendment***

Applicants' amendment filed on April 01, 2003 has been entered on June 09, 2003. Therefore claims 1,5,7-9,13,15,23,27 and 28 as amended by the amendment and claims 3,10-12,14 and 25-26 as previously recited are currently pending in the Application.

Claims 4,6 and 24 have been cancelled by the present amendment.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-15 and 23 –28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahmad et al. ( U.S. Patent No. 5,405,791 hereinafter Ahmad) .previously applied and in view of Arai et al. ( U. S. Patent No. 5,972,783 herein after Arai).

With respect to claim 1, Ahmad describes a process of forming a gate structure on a semiconductor substrate including: providing a semiconductor substrate having a channel region formed therein so as to define source and a drain region ( Ahmad fig. 5(A), identical to steps shown in applicants' figures 1-2 etc. and described in the specification pages 4 to 6 ), and a gate structure comprised of a gate dielectric positioned on said channel region and a conductive layer positioned on said gate dielectric ( Ahmad fig. 5 (A)).

Ahmad does not specifically describe implanting nitrogen in to said substrate .

Arai in fig. 1(b), etc. and col. 12 lines 45-63 describes implanting nitrogen in to said substrate to better control the crystallinity thereby reducing transistor degradation and provide a transistor with better performance and reliability.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include Arai's implantation step in Ahmad's process to better control the crystallinity thereby reducing transistor degradation to provide a transistor .with better performance and reliability. ( Arai col. 13 lines 60-64).

The remaining limitations of claim1 are :

Conducting a source/drain reoxidation, thereby forming a sidewall spacer after implanting nitrogen . ( Ahmad fig. 2, col. 3 Lines 53-57).

With respect to claim 3, wherein the substrate comprises silicon. (Ahmad col. 3 line 31) .

With respect to claim 5, wherein implanting nitrogen with greater than 10 raised to 12 nitrogen atoms. ( Arai col. 12 lines 62-63).

With respect to claim 8, wherein oxidizing said portion further comprises growing a bird's beak region extending laterally into a selected portion of said conductive layer . (Ahmad fig. 4 # 22 and Arai fig. 1 ( b) # 5a).

With respect to claims 9 and 10 (to the extent understood), 10 wherein conducting said source/drain reoxidation comprises forming a nitride layer on the semiconductor substrate and wherein the nitride layer laterally extends under at least a portion of the conductive layer. ( Ahmad figure 2 and col. 3 lines 63-64 ).

With respect to claim 11, wherein the gate dielectric comprises silicon oxide ( Ahmad col. 3 line 51).

With respect to claim 12, wherein a second sidewall spacer is deposited over the sidewall spacer. ( Ahmad figure 4).

With respect to claim 13, it repeats the steps of claims 1-12 stated above and further adds a protective layer over the source and drain regions, said protective layer comprising said insulator element and characterized by a dielectric constant higher than that of silicon oxide ( Ahmad col. 3 lines 64 – silicon nitride layer ).

With respect to claim 14, it repeats the steps of claims 8-10 and 13 and is rejected for reasons set out above.

With respect to claim 15 it repeats the steps of claim 1, 6 and 8 and is rejected for reasons set out under claims 1, 4, 6 and 8.

With respect to claim 23, Ahmad and Arai describe a process of eliminating hot electron injection into a gate electrode positioned on a gate oxide adjacent a channel interposed between a source and a drain region in a silicon substrate, the process comprising : forming a nitrogen doped region in said source and drain regions by nitrogen implantation ( Arai fig. 19b) etc.) , forming silicon nitride film over a portion of said gate electrode so that a portion of said silicon nitride film penetrates under said gate electrode during said forming step wherein said portion of said silicon nitride film prevents hot electron injection into said gate electrode wherein forming said silicon nitride film includes conducting a source/drain reoxidation after forming said nitrogen doped region ( Ahmad col. 3 line 56 to col. 4 line 5 ). ( Ahmad fig. 2, col. 3 Lines 53-57).

With respect to claim 24, wherein forming the silicon nitride film comprises exposing the gate electrode to an oxidizing ambient ( Ahmad col. 4 lines 5-9, ozone atmosphere) .

With respect to claim 26, wherein an insulation layer is deposited over the gate electrode . ( Ahmad fig. 3) and an isotropically etching said insulating layer to form sidewall spacers . ( Ahmad col. 6 lines 3 to 10).

With respect to claim 27, wherein the source/drain is implanted. ( Ahmad fig. 5).

With respect to claim 28, further comprising lightly doping said source and drain regions to grade a junction between said channel and said source and drain regions. ( Ahmad figs. 8 to 10, and Arai fig. 2( d ),etc.) .

### ***Response to Arguments***

Applicant's arguments with respect to claims 1, 3-15 and 23- 28 have been considered but are not persuasive for reasons set out below.

Applicants' other contention that Ahmed does not teach any nitrogen implantation and Arai does not teach source/drain reoxidation is based upon impermissible piecemeal attacks on references that cannot show nonobviousness where as herein the rejections are based on combinations of references. (See In re Keller, 208 USPQ 871, CCPA 1981).

Applicants' contention that the sequence of steps recited in the claims is not acknowledged is not persuasive because it is well settled law that Applicants' reversed order of process sequence as compared to reference's cannot be considered as an act of invention, since reversing the order of prior art process step is held to render the

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claims prima facie obvious. Ex parte Rubin, 126 USPQ440 ( BAPI 1959). The selection of any order of performing process steps is prima facie obvious in absence of new or unexpected results. In re Burhaus, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

Applicants' contention that Arai does not teach reoxidation is not persuasive because Arai in col. 12 lines 40-44 and 54-67 teaches source/drain reoxidation.

Therefore none of the Applicants' arguments are persuasive.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven H. Rao whose telephone number is (703) 3065945. The examiner can normally be reached on 8.00 to 5.00.

The fax phone numbers for the organization where this application or proceeding is assigned are (703) 7463926 for regular communications and (703) 872-9319 for After Final communications.

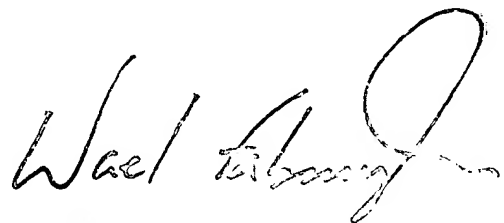
Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 3067722.



Steven H. Rao

Patent Examiner

6/14/03



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